

CLAIMS

1. A method of magnetic measurement of the position
and the orientation of a mobile object with
5 respect to a fixed structure, in which a first
emitter assembly includes at least two orthogonal
coils for emitting magnetic fields, integral with
said fixed structure, which define a reference
frame, and means of emission for injecting
10 predetermined emission currents into said coils at
first frequencies, in which a second sensor
assembly includes at least two orthogonal coils
for detecting magnetic fields, integral with said
mobile object, sensor channels with servocontrol
15 loops for producing in feedback coils coupled to
said detection coils feedback magnetic fields by
injection of measurement currents and a
calibration channel for elaborating at least one
calibration voltage, and in which at least one
20 acquisition channel is provided for extracting
measurement values of said emission channels, said
sensor channels and said calibration channel and
means of calculation and of processing estimate,
on the basis of said measurement values, the
25 magnetic fields detected in the second sensor
assembly and deduce therefrom the position and the
orientation of said mobile object in said
reference frame, said method being characterized
in that said calibration voltage comprises only
30 terms with at least two frequencies distinct from
said first frequencies and in that said method
comprises a step of injecting calibration currents
and voltages into said channels of the sensor so
as to produce calibration measurement values
35 identified by their frequency, a step of
estimating by the means of calculation the
transfer function of each of the sensor channels
and a step of deducing by said means of
calculation the magnetic fields detected on the

basis of said measurement values and of the inverse of said estimated transfer functions.

2. The method as claimed in claim 1, in which the
5 servocontrol loops of the sensor channels provide
output voltages (V_{c1} to V_{c3}) producing said
measurement currents and said measurement currents
flow through measurement resistors (R_{M1} to R_{M3}) so
as to provide measurement voltages (V'_{c1} to V'_{c3}),
10 characterized in that the calibration voltage is
superimposed on said output voltages for the
production of said measurement currents, and in
that said step of estimating the transfer
functions is performed, on the basis of the
15 separation of the calibration frequency terms in
said output voltages, by polynomial approximation
for said first frequencies.
3. The method as claimed in claim 2, characterized in
20 that the calibration currents are injected onto
said measurement resistors and in that the value
of the variable components of said channels of the
sensors is identified on the basis of the
separation of the calibration frequency terms in
25 the output voltages and the measurement voltages.
4. The method as claimed in claim 3, characterized in
that the separation of the calibration frequency
terms and their measurement is performed with the
30 aid of a separate acquisition channel (G_{acq4})
multiplexed in time so as to process during a
calibration cycle the measurement voltages of the
sensor channels, the emission currents, the
calibration channel and the output voltages of the
35 sensor channels.
5. A device for the magnetic measurement of the
position and the orientation of a mobile object
with respect to a fixed structure, of the type

comprising:

- 5 - a first emitter assembly including at least two
 orthogonal coils (12_1 to 12_3 ; Bb_E) for emitting
 magnetic fields, integral with said fixed
 structure and defining a reference frame, and
 means of emission (100 , 11_1 to 11_3 , 13_1 to 13_3 ;
 R_E) for injecting predetermined currents (i_{E1} to
 i_{E3}) into said coils at first frequencies and
10 constituting with said coils at least two
 emission channels;
- a second sensor assembly including at least two
 orthogonal coils (13 ; Bb_{d1} to Bb_{d3}) for detecting
 magnetic fields, integral with said mobile
 object, means of measurement (21 to 25 , Bb_{CR} , R_M)
15 by servocontrol loops, for producing in feedback
 coils (Bb_{CR1} to Bb_{CR3}) coupled to said detection
 coils feedback magnetic fields by injection of
 measurement currents (i_{c1} to i_{c3}) and for
 constituting with said detection coils at least
20 two sensor channels, and means of calibration
 comprising a calibration channel (CNA_{cal} , $B1$, 30)
 for elaborating at least one calibration voltage
 (V_{cal}) at second frequencies;
- at least one acquisition channel (28 , $B1$, CAN_E ;
25 Am_1 to Am_4 , F_1 to F_4 , $B1$, CAN) for measurements
 for extracting measurement values (V'_{c1N} to V'_{c3N} ,
 V_{EN}) of said emission channels, said sensor
 channels and said calibration channel; and
- means of calculation and processing (60) for
30 estimating, on the basis of said measurement
 values, the magnetic fields detected in the
 second sensor assembly and deducing therefrom
 the position and the orientation of said mobile
 object in said reference frame,
35 characterized in that said second frequencies are
 distinct from said first frequencies, in that said
 means of calibration are provided so as to inject
 calibration currents and voltages into said sensor
 channels so as to produce calibration measurement

values identified by their frequencies and addressed to said means of calculation by the acquisition channel or channels and in that said means of calculation and processing (60) are provided so as to estimate the transfer function of each of the sensor channels and to deduce the magnetic fields detected from said measurement values and from the inverse of said estimated transfer functions.

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6. The device as claimed in claim 5, characterized in that said sensor channels each comprise a feedback coil (Bb_{CR1} to Bb_{CR3}) coiled onto the same magnetic core as the associated detection coil (Bb_{d1} to Bb_{d3}), corrector amplifier means (22, 23; 41 to 43) for generating on the basis of the signal at the terminals of the detection coil an output voltage (V_{c1} to V_{c3}), and amplifier/current generator means (24, R_s ; 241 to 243, R_{s1} to R_{s3} ; A_{21} to A_{23}) for elaborating a feedback current (i_c ; i_{c1} to i_{c3}) injected into the associated feedback coil and a feedback current measurement resistor (R_{M1} to R_{M3}) traversed by said current so as to provide a measurement voltage (V'_{c1} to V'_{c3}), and in that said means of calibration furthermore comprise first means (44 to 46) of injecting the calibration voltage onto said amplifier/current generator means and second means (31, 51 to 53) for injecting a calibration current (i_{cal}) proportional to said calibration voltage (V_{cal}) onto said measurement resistors (R_{M1} to R_{M3}).

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7. The device as claimed in claim 6, characterized in that said acquisition channels comprise first acquisition channels (G_{acq1} to G_{acq3}) for processing in continuous mode said measurement voltages respectively of each sensor channel, a sampled acquisition channel (G_{acq4}) for processing in time multiplex mode the calibration signals present in

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5 said output voltages of the sensor channels, in
the measurement voltages of these same channels
and in the sum of the emission currents, and said
emission currents; and means of multiplexing (55,
56) for applying said signals processed by the
sampled acquisition channel onto the input of the
latter.